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REMARKS

The application has been reviewed in light of the Office Action dated June 27, 2006. Claims 1-10 and 13-19 are pending, with claims 11-12 having previously been canceled, without prejudice or disclaimer. By this Amendment, claims 1 and 15-17 have been amended to clarify the claimed invention. Accordingly, claims 1-10 and 13-19 are presented for reconsideration, with claims 1 and 15-17 being in independent form.

Claims 1-2, 4, and 8-19 were rejected under 35 U.S.C. §102(b) as purportedly anticipated by Pruessmann et al. (MRM 42:952-962). Claim 3 was rejected under 35 U.S.C. §103(a) as purportedly unpatentable over Pruessmann in view of U.S. Patent No. 6,242,916 to King. Claim 5 was rejected under 35 U.S.C. §103(a) as purportedly unpatentable over Pruessmann in view of U.S. Patent No. 4,770,182 to Damadian et al. Claims 6 and 7 were rejected under 35 U.S.C. §103(a) as purportedly unpatentable over Pruessmann in view of U.S. Patent No. 6,289,232 to Jakob et al.

Applicant has carefully considered the Examiner's comments and the cited art, and respectfully submits that independent claims 1 and 15-17 are patentable over the cited art, for at least the following reasons.

The present application relates to improvements to a magnetic resonance imaging (MRI) apparatus using a plurality of receiving coils which render the apparatus suitable for rapidly imaging a tissue structure inside an object to be examined. The improved apparatus acquires examination image data of each of the plural receiving coils from a plurality of slice positions sequentially adjoining on the object by executing a first pulse sequence using the plural receiving coils while a phase encoding matrix in a k space is thinned out, acquires sensitivity image data by executing a second pulse sequence using the plural receiving coils from first and second slice

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positions, which have at least one unacquired slice position therebetween, of the plural slice positions on the object, the sensitivity image data of the receiving coils of the at least one unacquired slice position being calculated with a slice interpolation using the sensitivity image data of the first and the second slice positions, generates sensitivity distribution data of the plural receiving coils on the slice positions of the examination image data on the basis of the plural sensitivity image data, and removes an aliasing artifact in the examination image using the sensitivity distribution data of the receiving coils. Each of independent claims 1 and 15-17 addresses these features, as well as additional features.

Pruessmann, as understood by Applicant, proposes a sensitivity encoding (SENSE) technique based on the premise that receiver sensitivity has an encoding effect complementary to Fourier preparation by linear field gradients. Pruessmann, in the section entitled, "Determination Of Sensitivity Maps" (pp. 956-57), proposes that a 2D polynomial is fit to a raw map to eliminate noise and smooth the raw map. The fitting polynomial  $s(x,y)$  {equation [25]} has two dimensional parameters  $x$  and  $y$ , but such a parameter expressing slice order index suggests that the fitting polynomial is applicable only to a 2D image, and does not suggest that sensitivity image data of an unacquired slice position can be calculated with a slice interpolation using sensitivity image data of acquired slice positions away from the unacquired slice position.

Applicant simply does not find teaching or suggestion in Pruessmann, however, of acquiring sensitivity image data by executing a second pulse sequence using the plural receiving coils from first and second slice positions, which have at least one unacquired slice position therebetween, of the plural slice positions on the object, the sensitivity image data of the receiving coils of the at least one unacquired slice position being calculated with a slice interpolation using the sensitivity image data of the first and the second slice positions, as

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provided by the subject matter of amended claim 1.

The remaining references were cited only against dependent claims of the present application.

King, as understood by Applicant, proposes an approach for nuclear magnetic resonance (NMR) imaging wherein partial data sets are acquired from limited fields of view and images are reconstructed from such data sets. King was cited in the Office Action as purportedly proposing using a body coil to transmit RF pulses as well as receive them.

Damadian, as understood by Applicant, proposes an approach for medical screening utilizing an NMR apparatus that has a limited scanning region. Damadian was cited in the Office Action as purportedly proposing use of a multi-slice pulse sequence in MRI.

Jakob, as understood by Applicant, proposes an approach for MRI by exploiting spatial information inherent in a surface coil array to increase image acquisition speed, resolution and field of view. Jakob was cited in the Office Action as purportedly proposing use of coil sensitivity information to accelerate imaging.

However, Applicant does not find disclosure or suggestion in the cited art of a magnetic resonance imaging apparatus which acquires sensitivity image data by executing a second pulse sequence using the plural receiving coils from first and second slice positions, which have at least one unacquired slice position therebetween, of the plural slice positions on the object, the sensitivity image data of the receiving coils of the at least one unacquired slice position being calculated with a slice interpolation using the sensitivity image data of the first and the second slice positions, generates sensitivity distribution data of the plural receiving coils on the slice positions of the examination image data on the basis of the plural sensitivity image data, and removes an aliasing artifact in the examination image using the sensitivity distribution data of the

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receiving coils, as provided by the subject matter of amended claim 1.

Independent claims 15-17 are patentably distinct from the cited art for at least similar reasons.


Accordingly, for at least the above-stated reasons, Applicant respectfully submits that independent claims 1 and 15-17, and the claims depending therefrom, are patentable over the cited art.

In view of the claim amendments and the remarks hereinabove, Applicant submits that the application is now in condition for allowance, and earnestly solicits the allowance of the application.

If a petition for an extension of time is required to make this response timely, this paper should be considered to be such a petition. The Patent Office is hereby authorized to charge any fees that may be required in connection with this amendment and to credit any overpayment to our Deposit Account No. 03-3125.

If a telephone interview could advance the prosecution of this application, the Examiner is respectfully requested to call the undersigned attorney.

Respectfully submitted,

  
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